

# OPTICAL FIBER AND OPTICAL AMPLIFIER

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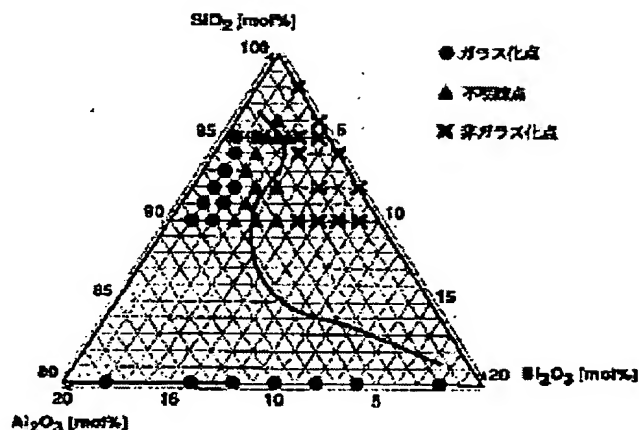
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## Abstract of JP2002252397

**PROBLEM TO BE SOLVED:** To provide a highly efficient optical fiber and optical amplifier which are suitable for the amplification of a 1.3- $\mu$ m band.

**SOLUTION:** In the optical amplifier, the optical fiber which is made of Bi-doped silica glass expressed by  $x\text{Bi}_2\text{O}_3 - y\text{Al}_2\text{O}_3 - (1-x-y)\text{SiO}_2$  ( $x < y$ ) and containing  $\text{Bi}_2\text{O}_3$  in the amount of 0.1-10.0 mol% and  $\text{Al}_2\text{O}_3$  in the amount of 2-20 mol% and conducts light amplification of the 1.3  $\mu$ m band for semiconductor laser excitation of a 0.8  $\mu$ m band is used.



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[Claims]

[Claim 1] An optical fiber comprising a Bi-doped silica glass expressed by  $x\text{Bi}_2\text{O}_3 \cdot y\text{Al}_2\text{O}_3 \cdot (1-x-y)\text{SiO}_2$ ,

wherein the content of  $\text{Bi}_2\text{O}_3$  and  $\text{Al}_2\text{O}_3$  are in the range of 0.1 to 10.0 mol% and 2 to 20 mol%, and  $x < y$ .

\*\*\*\*

[Claim 3] An optical amplifier using an optical fiber,

wherein the optical amplifier performs the amplification of signal light in a 1.3  $\mu\text{m}$  band, and

the optical fiber comprising a Bi-doped silica glass expressed by  $x\text{Bi}_2\text{O}_3 \cdot y\text{Al}_2\text{O}_3 \cdot (1-x-y)\text{SiO}_2$ ,

wherein the content of  $\text{Bi}_2\text{O}_3$  and  $\text{Al}_2\text{O}_3$  are in the range of 0.1 to 10.0 mol% and 2 to 20 mol%, and  $x < y$ .

\*\*\*\*

[0004] In this figure (Fig. 10), the numeral 101 represents an incident side, the numerals 102 and 105 represent an optical fiber, the numeral 103 represents optical input signals, the numeral 104 represents a semiconductor laser, the numeral 106 represents optical output signals, and the numeral 107 represents an emitting side. The optical input signals 103 are emitted from the emitting side 107 after being amplified by the semiconductor laser 104.

[0005] Figure 11 illustrates a schematic configuration representing a conventional optical amplifier.

[0006] In this figure, the numeral 111 represents an incident side, the numerals 112, 115 and 117 represent a conventional optical fiber, the numeral 113 represents optical input signals, the numeral 114 represents a semiconductor laser as an exciter, the numeral 116 represents an amplifier (rare earth element-doped fiber), the numeral 118 represents optical output signals, and the numeral 119 represents an emitting side. After transmitting the excitation light to the amplifier 116, which is derived from the semiconductor laser 114, the optical output signals 118 being amplified are emitted from the emitting side 119.

\*\*\*\*

[0033] (Example 2) The glass composition contains the following components, indicated by molar ratio:  $\text{Bi}_2\text{O}_3\text{:Al}_2\text{O}_3\text{:SiO}_2 = 3\text{:}7\text{:}90$  (indicated by weight ratio:  $\text{Bi}_2\text{O}_3\text{:Al}_2\text{O}_3\text{:SiO}_2 = 18.6\text{:}9.5\text{:}72$ ). Figure 6 illustrates the fluorescence property of the glass in response to the excitation light at 833 nm. In Figure 6, the horizontal axis and the vertical axis indicate wavelength (nm) and intensity (relative units), respectively.

\*\*\*\*

[0035] (Example 3) The glass composition contains the following components, indicated by molar ratio:  $\text{Bi}_2\text{O}_3\text{:Al}_2\text{O}_3\text{:SiO}_2 = 1.5\text{:}3.5\text{:}95$  (indicated by weight ratio:  $\text{Bi}_2\text{O}_3\text{:Al}_2\text{O}_3\text{:SiO}_2 = 10.3\text{:}5.3\text{:}84$ ). Figure 8 illustrates the fluorescence property of the glass in response to the excitation light at 833 nm. In Figure 8, the horizontal axis and the vertical axis indicate wavelength (nm) and intensity (relative units), respectively.

[0036] (Example 4) The glass composition contains the following components, indicated by molar ratio:  $\text{Bi}_2\text{O}_3\text{:Al}_2\text{O}_3\text{:SiO}_2 = 6\text{:}14\text{:}80$  (indicated by weight ratio:  $\text{Bi}_2\text{O}_3\text{:Al}_2\text{O}_3\text{:SiO}_2 = 31\text{:}15.8\text{:}53$ ). Figure 9 illustrates the fluorescence property of the glass in response to the excitation light at 833 nm. In Figure 9, the horizontal axis and the vertical axis indicate wavelength (nm) and intensity (relative units), respectively.

Fig. 6

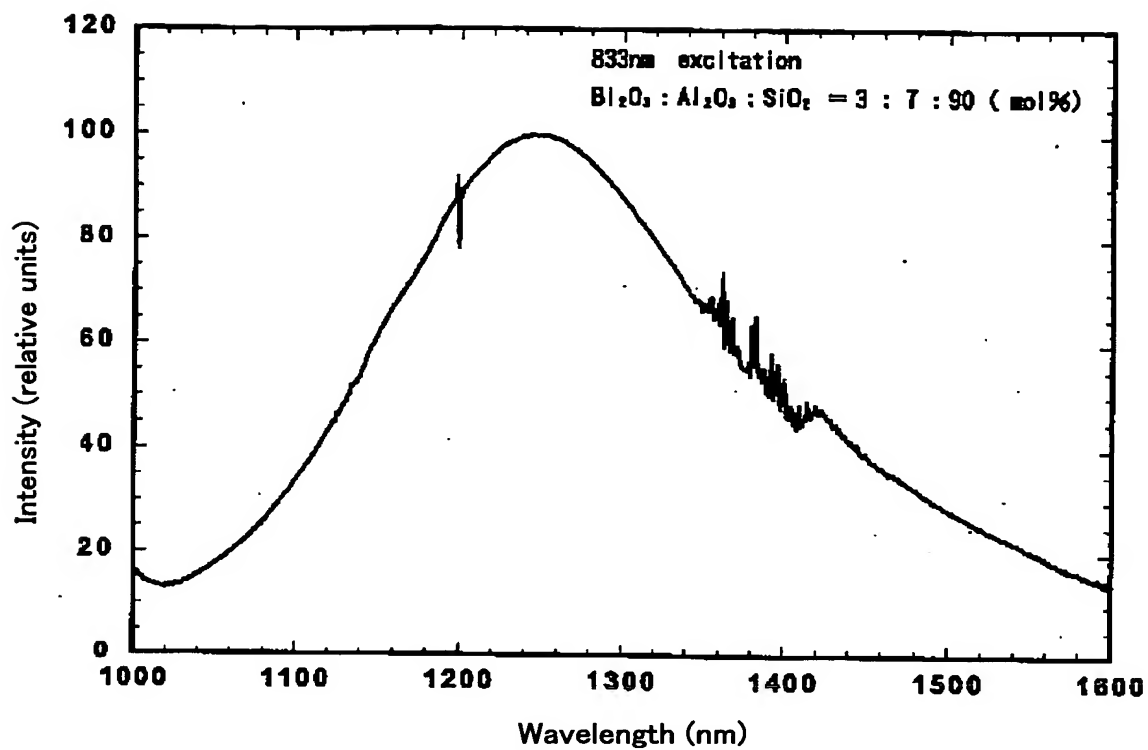


Fig. 8

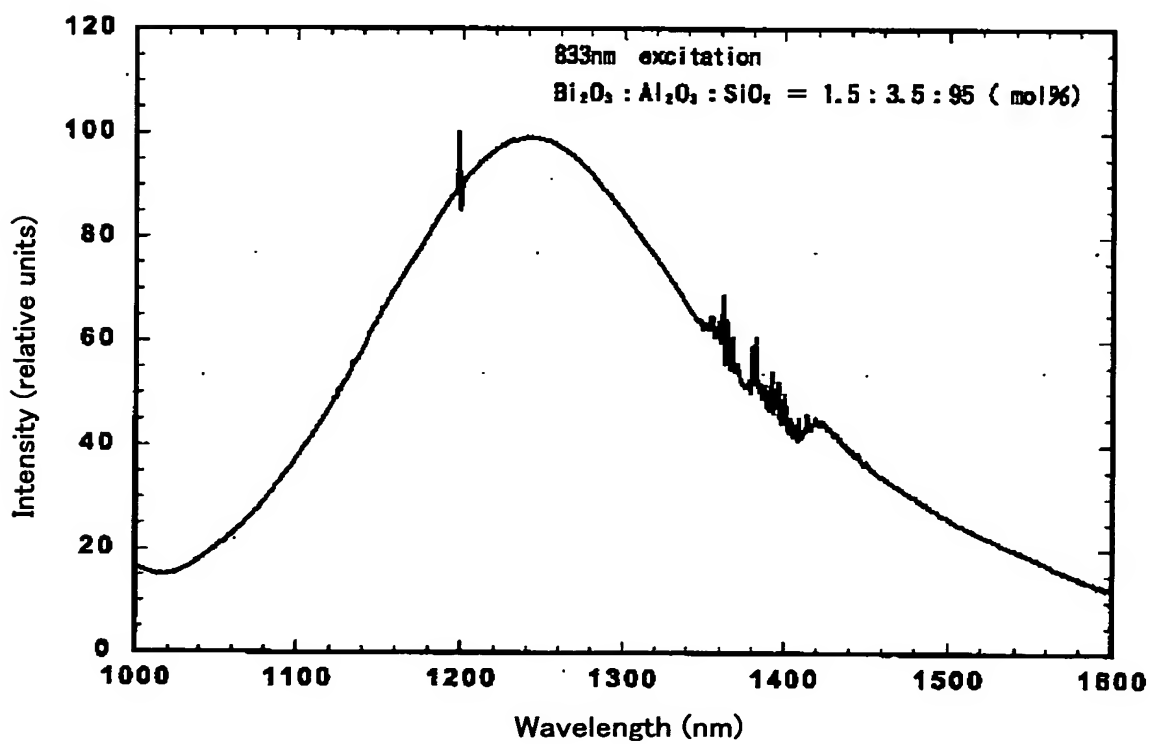


Fig. 9

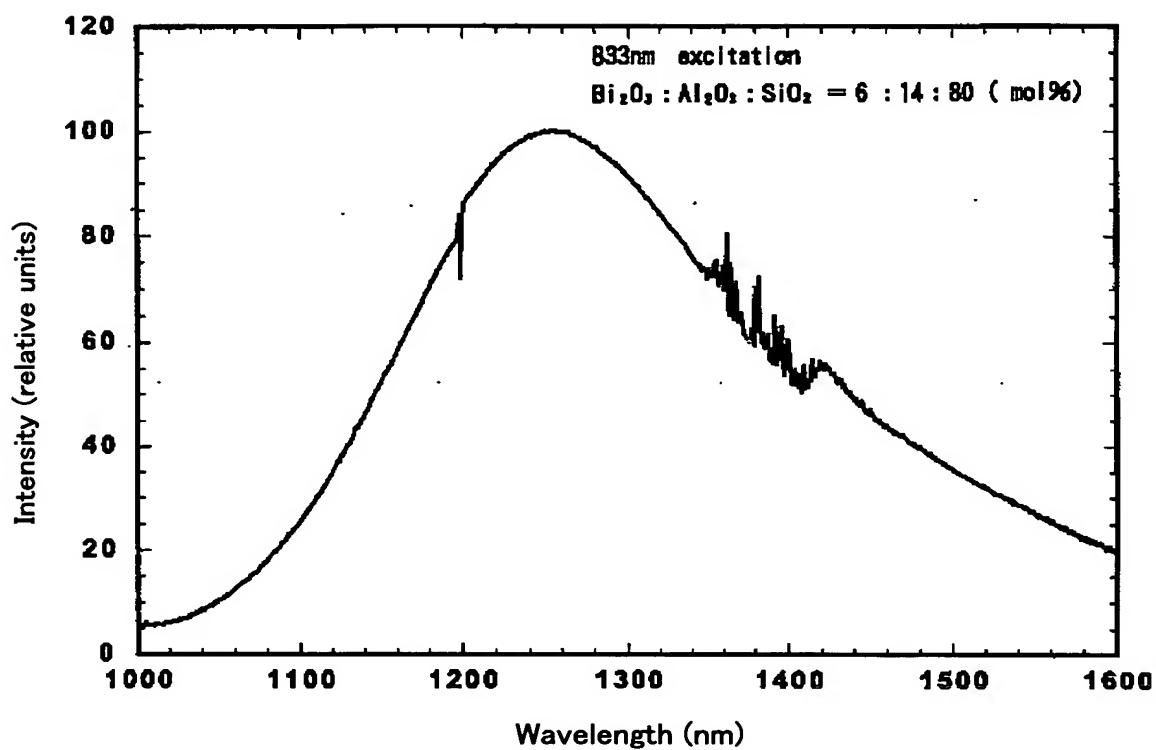
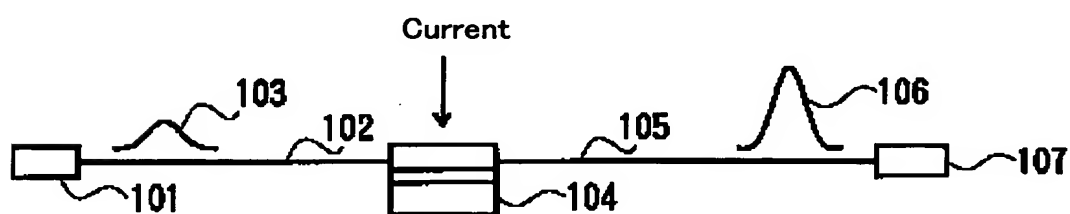
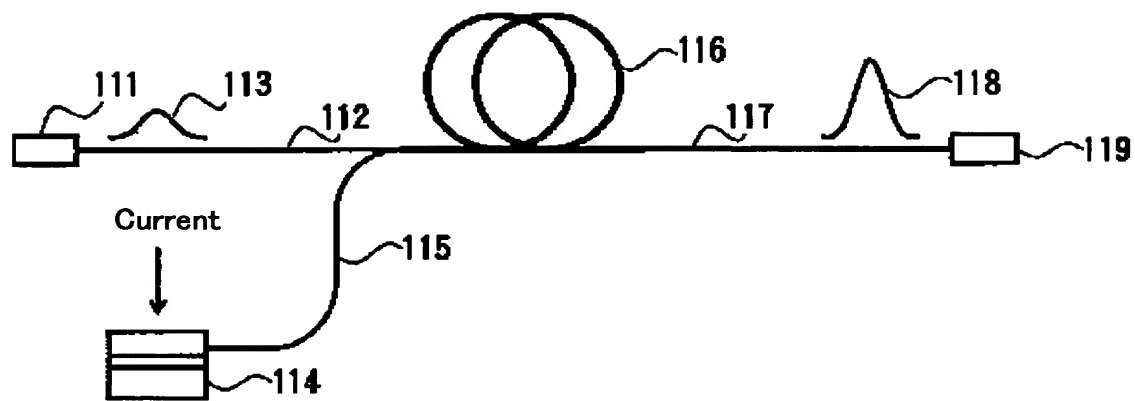


Fig. 10



- 101 incident side
- 102 optical fiber
- 103 optical input signals
- 104 semiconductor laser
- 105 optical fiber
- 106 optical output signals
- 107 emitting side

Fig. 11



- 111 incident side
- 112 conventional optical fiber
- 113 optical input signals
- 114 semiconductor laser as an exciter
- 115 conventional optical fiber
- 116 amplifier (rare earth element-doped fiber)
- 117 conventional optical fiber
- 118 optical output signals
- 119 emitting side

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